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CLASSROOM METHODS AND DEVICES

Physiology and Hygiene for Prevocational Boys

In the introductory article of this series it was pointed out that the purpose of prevocational work was dual: first, to incite intellectual activity by means of a new and more vital interest in one or more of the regular school subjects, and second, to increase the pupil's potential occupational efficiency as an insurance against incompetency should he be forced into work at the earliest possible moment.

If properly conducted no subjects have greater possibilities in both respects than physiology and hygiene. . Children of prevocational age may easily be interested in a study of the body and of the laws, both physical and social, which govern its development and secure the conservation of its powers.

At first thought it may seem unnecessary to present arguments in favor of introducing the study of physiology into the course of study when instruction in this subject is required by law in so many states. It should be appreciated, however, that physiology is seldom taught to the pupils with whom these articles are dealing, such instruction being reserved for the grades which they rarely reach, or, if given in the lower grades, being of such a nature as to make little appeal to the children of this type and to have practically no effect on their mode of living. Furthermore, where the subject is taught to industrial classes it is still in its experimental stage, which fact warrants a statement of our principles as well as of our practices. We would give briefly, therefore, the reasons why this instruction is peculiarly pertinent for prevocational pupils.

The study of physiology is, by its very nature, of genuine interest to pupils of this age, and this interest may be utilized in leading the children, not only to take better care of their bodies, but to appreciate the real value of other sciences which are more or less closely related.

The study of hygiene is perhaps even more effective as a means of developing occupational efficiency. Much thought, time, and money have been expended in developing courses of study which will contribute to the pupil's ability to take his place in the ranks of the world's workers. There are no means of evaluating this training in terms of increased efficiency, though careful observers have little doubt that such training actually enables the pupil to find his place in industry more quickly after leaving school and to fill it more acceptably. There must always be a question, however, as to just how great the advantage of this training may be over that afforded by the traditional school courses. But even a superficial examination of the facts will convince one that any improvement in the physical condition of the industrial worker will certainly increase his efficiency. Improper diet, unhygienic housing and working conditions, and any infringement of the laws of physical life result in a sapping of energy and a loss of time from sickness which often prove a serious handicap in the competitive struggle with those more liberally endowed by nature with strong bodies and by circumstances with more invigorating surroundings either at home or in the work-place.

While the efficiency and the period of usefulness of the workingman depends more largely upon his health than upon any other one thing, he rarely has any adequate knowledge of the effect which his mode of life and his surroundings have upon his physical health and strength. It would seem natural that the people's schools, especially those which exist primarily to secure greater efficiency in the future industrial worker, should devote a great deal of attention to a subject of such vital importance. An examination of the courses of study in the various industrial schools will convince one, however, that little consideration is usually given this subject. It will be seen, therefore, that any study or training which tends to improve the pupil's health or to make him more intelligent regarding the laws which society has enacted for the benefit of child or adult workers will possess real vocational value. As it will quite as certainly contribute to the pupil's culture, the study of physiology and hygiene is eminently suitable for all prevocational classes.

Authorities differ as to the best method of teaching the subject and especially as to whether a study of physiology should precede instruction in hygiene. Tolman, in his excellent book *Hygiene for the Worker*,[1] begins his preface with this sentence: "The teaching of hygiene fails when it is founded upon the assumption that a knowledge of anatomy is necessary."

Ritchie, in the preface to his *Human Physiology*, says: "Neither can the desired end be reached by teaching the rules of health without an anatomical and physiological basis; for without such a basis, hygiene is an intangible and an elusive subject."

There are many reasons why the course in hygiene should be preceded, wherever possible, by an elementary and eminently practical study of anatomy and the functions of the various organs of the body. Some of these reasons may be stated as follows:

1. Unless it is based on some knowledge of physiology, hygiene must be taught through mere memorizing and not through processes of reasoning.

2. To arouse the young worker's interest in hygiene without giving him some scientific knowledge of the different organs of his body may lead him to fall a prey to the first quack doctor with whom he comes in contact. If the technical and scientific terms are avoided altogether, the pupil is likely to be awed or unduly impressed by the first person whom he hears glibly using them on the street corners.

3. For children of the age with which we are dealing in these articles there is reason to believe that physiology will be more *interesting* than hygiene and therefore should precede and vitalize it. Dr. Peter Sandiford, in *The Mental and Physical Life of School Children*, says: "Curiosity about the mechanism of the human body does not awaken before adolescence, hence it is worse than useless to try to teach physiology to ten-year-old children. But physiology to fifteen-year-olds is one of the most fascinating subjects in the curriculum."

4. There are many devices for teaching physiology which make a strong appeal to motor-minded children. For example, the mechanics of the respiratory system may be shown by means of a

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[1] William H. Tolman, *Hygiene for the Worker*. American Book Co.

glass tube, the air pump, and a small rubber bag.[1] *The Human Mechanism*, by Hough and Sedgwick, will be found helpful in dealing with the various systems of the body from a mechanical standpoint.

A study of such physiology as time will permit, together with the personal hygiene which quite naturally grows out of the discussions, leads logically to some consideration of "industrial hygiene" which ought to be of interest to all future industrial workers. It can be made especially valuable to them through the assistance which it may give in choosing an occupation, or, perhaps, in refraining from doing so. Such a study should seek to inform the children about their own physical powers, or lack of such, and it should also show that the peculiar advantages or dangers of a given position ought to be considered as carefully as circumstances will permit before any occupation is entered. Gradually the schools are coming to assume some responsibility in this matter. Miss Florence M. Marshall, principal of the Manhattan Trade School for Girls, says: "It would be little short of criminal neglect to permit a girl to train for a standing trade who has a flat foot." Letting this serve as a simple illustration of the two factors involved—the physical condition of the worker and the physical demands of the occupation—it is clear that a variety of data can be secured which the teacher may classify and present as best suits the educational and economic conditions of his own pupils. Further illustrations are given in one of the class talks outlined later in this article.

It is to be regretted that industrial hygiene today deals more with disease than with health. Since its line of attack is to abolish unhygienic conditions, it must necessarily call especial attention to the dangers and diseases which inhere in so many occupations. It may appear, therefore, that the details presented herewith serve as warnings to avoid certain positions rather than as guides to suitable occupations. It is sometimes affirmed that, since children *must* enter more or less dangerous and debilitating occupations, there is little value in taking this merely negative attitude and in warning them against doing so—that the more important thing is to instruct young people how to minimize the dangers and the harmful effects of their occupations. It must be remembered, however, that society is regulating more carefully year by year or even prohibiting the entry of children into dangerous trades, and is also seeking to reduce the dangers. The surest way to induce industry to ameliorate these unfortunate conditions is to put an embargo on the supply of necessary labor or, by other means, to render the practices expensive. The truth of this statement is amply sustained by the attitude of employers toward the "safety first" movement after the passage of a workingman's compensation law.

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[1] Hough and Sedgwick, *The Human Mechanism* (Ginn & Co.), "Mechanics of Breathing Movements," p. 169; "Mechanics of the Heart Beats," p. 138; "Apparatus to Illustrate Circulation," p. 152.

There is no economic necessity for this species of human sacrifice and the schools should ally themselves uncompromisingly with all other child-saving agencies in its curtailment or its entire abolition. Of course, for some time to come children will enter such occupations, and so the teacher should present also the positive side of the question and show the potential workers how to protect themselves in every possible way.

While, as above stated, a general interest in the subject may be assumed, it is desirable to vitalize or popularize this interest by some initial lessons intended to show the children the economic or money value of the proper care of the body. The following are suggested as sources of material for such lessons:

Bulletins of the National Safety Council, Continental and Commercial Bank Building, Chicago. There are hundreds of employers who are members of this council. They receive weekly bulletins relating to the prevention of industrial accidents and diseases as well as those common to all walks of life. The bulletins are posted in the factories or other places of employment for the information and guidance of the workmen. Membership may be secured by the payment of an annual fee of $5.00. A copy of one of these bulletins is shown on p. 306.

The Metropolitan Life Insurance Company, New York, distributes, free of cost, pamphlets on "The Health of the Worker," "First Aid in the Home," "Milk," "Teeth, Tonsils, and Adenoids." This fact clearly indicates the money value of preserving the health, and the pupils will find in the pamphlets much excellent advice.

The Sanitol Educational Company, St. Louis, Missouri, publishes a set of drawings by H. Reichard which show the growth of the teeth and indicate how necessary it is to care for them.

With judicious use, an advertisement published by Colgate & Company, Jersey City, New Jersey, entitled "Dental Hygiene," will be found valuable.

(Distributed by NATIONAL SAFETY COUNCIL, Chicago, Ill.)

To All Our Employes:

CONCERNING PNEUMONIA

The Pneumonia season has arrived.

Not because the weather is colder—Arctic explorers do not get Pneumonia until they return to 'Civilization.'

Not because of raw winds, though these chill the body and thereby reduce resistance to the disease.

Pneumonia comes at this season because people close doors and windows to keep out cold air, and thereby condemn themselves to breathe foul air in which the Pneumonia germ rejoices and multiplies.

Keep your houses as warm as you like. People in this country are accustomed to warm rooms, and it would be foolish to make a sudden change.

But see that the place where you live and work has as much fresh air as possible.

A closed window shuts sickness IN, not OUT.

As mentioned above, the presentation of such material as this impresses the pupils with the fact that it "pays" to keep well.

Another method of giving a practical introduction to the subject of physiology is to discuss industrial fatigue. In this connection the teacher would do well to consult Miss Goldmark's authoritative work, *Fatigue and Efficiency*.[1] Answers to questions like the following may be brought out in the course of informal discussions supplemented by assigned readings from a few reference books, in which case particular pages and paragraphs should be selected to simplify the work:

QUESTIONS

1. What is fatigue? (Goldmark, p. 22; Hough and Sedgwick, p. 55.)
2. Of what importance is its study to the industrial worker?

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[1] Josephine Goldmark, *Fatigue and Efficiency*. Published by Charities Publication Committee, 105 East 22d Street, New York.

3. To what is muscular contraction due?

4. Can it be shown that this contraction of the muscles is a form of combustion?

5. What is necessary for combustion?

6. How is oxygen brought to muscles?

7. How is this oxygen carried in the blood?

8. What part in this process is played by the food we eat?

9. What are the elements in the carbohydrates?

10. What are the results of the union of oxygen and glycogen? (Goldmark, p. 22.)

11. What is energy?

12. What becomes of the heat?

13. What becomes of the carbon dioxide and other wastes?

14. What is meant by the fatigue poison? (Hough and Sedgwick, p. 60.)

15. What is the remedy for fatigue? (Goldmark, p. 25.)

Although there are no text or reference books just suited to the needs of the prevocational work in this subject, the following are recommended for use in the above and in similar lessons: *Good Health*, *Emergencies*, *The Body at Work*, *Town and City*, *Control of Body and Mind*, by Luther Halsey Gulick, and published by Ginn & Co.; *Primer of Hygiene*, *Primer of Sanitation*, *Human Physiology*, and *Primer of Physiology*, by John W. Ritchie, published by the World Book Co.

The practical phases of the question of fatigue may be made very real to the pupils by telling them of the studies of accidents in factories and their relation to fatigue. The results of one such study are given herewith.

It might be claimed with justice that eternal vigilance is the price of safety in some industries. It is necessary that the operative come to his work with mind alert and muscles under good control. That he fails to present himself in this condition accounts for many industrial accidents, as the following will show:

Statistics covering accidents in the factories of Illinois for a period of one year show that between the hours of eight and nine o'clock in the morning there were 120 accidents, and that this number steadily and progressively increased until, during the hour between eleven o'clock and noon, 257 accidents were recorded. In the hour following the noon rest, or between one and two o'clock, there were 111, the number again increasing hour by hour until, between four and five o'clock, the maximum of 260 accidents was reached. The most reasonable conclusion is that fatigue is responsible for the increase in the number of accidents in the late hours over the number in the early hours and raises the question why the first morning hour should not show a much lower record than it does. The difference between the early morning hour and the early afternoon hour is comparatively slight, but it is highly significant in that it points to possible personal negligence on the part of the operatives between five o'clock in the afternoon and the beginning of work the next morning. It brings to the front the subject of social conditions in general, opens the questions of personal hygiene in its relation to sleeping-quarters, habits of eating, drinking, smoking, and to the nature of such recreation as may have been taken.

In this connection it is perfectly feasible to teach the pupils something about the workingmen's compensation laws. While this may not be "hygiene," it grows directly out of "industrial hygiene," as it is a part of that movement which society is making to conserve the human element entering as such an important factor into the industrial problem. The whole "safety-first" movement is the result of this interest in conserving human life; and valuable material can generally be obtained from large manufacturing establishments where the movement has been placed in charge of one individual charged with the responsibility of reducing accidents.

This may seem a rather difficult subject for the children of prevocational age but, in reality, is it more so than much of the technical grammar and abstract mathematics which we have required children of this age to study? Does it not come nearer to life, as they know it, than much of the history and geography? And is it not the only possible foundation for such practical sociology and citizenship as the young industrial worker can possibly grasp? Concrete material for the discussion of this question can be had from many sources, but the bulletins of the American Association for Labor Legislation will be found sufficiently suggestive for the interested teacher.

In addition to the informaton which the pupils gain from text and reference books, from what may be called commercial material, and from personal observation, it will be necessary for the teacher to give class talks himself or to secure, from time to time, the voluntary assistance of men and women from the field. As an example of the kind of discussions which will be found interesting and valuable the two following are submitted.[1] They are adapted from Tolman's *Hygiene for the Worker.*

WHAT KIND OF POSITION SHOULD I SEEK?

Before taking any position the young worker should first submit to a thorough medical examination, such as is given in many schools today. This would furnish data regarding eyes, ears, chest, nose, throat, lungs, kidneys, back, hips, legs, and feet. If the individual is flat- or narrow-chested or afflicted with catarrhal or bronchial troubles, he should not work at file-cutting, painting, glass and metal grinding and polishing, stone-cutting, paper-hanging, gilding, some kinds of woodworking, grinding and cutting of mother-of-pearl and bone, nor in earthenware and china factories, because of the harmful dusts resulting from the processes employed in these industries. Neither should one seek employment as cigar-maker, tailor, shoemaker, engraver, or jeweler, because of the stooping position which must be taken in such work, thus cramping the lungs. Such persons should seek out-of-doors employment as far as possible.

Persons whose hearts are weak should not engage in occupations involving great strain upon this organ. They should not take work where there is much lifting or carrying of heavy loads, or where there is a constant strain on certain sets of muscles. Such persons are not physically fitted to become bakers, brewers, butchers, coopers, metal-grinders, millers, carpenters, weavers, stone masons, or machine-operators. They should engage in some light muscular work, but never neglect daily exercise.

Those having weak or inflamed eyes should avoid dusty trades, or those in which one comes in contact with heat, steam, vapors, and fumes. Persons who have vision in only one eye should not select an occupation where they are obliged to make accurate measurements on fine work requiring great care. Watchmakers, engravers, tailors, dressmakers, chemists, and draftsmen all require good eyesight, as the strain on their eyes is greater than in most othei trades.

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[1] Additional material of this nature may be found in such references as the following: Sir Thomas Oliver, *Dangerous Trades* (London: Murray); William H. Tolman, *Safety* (Harper & Brothers); George H. Ireland, *The Preventable Causes of Disease, Injury and Death in American Manufactories and Work-Houses* (American Public Health Association).

Persons who have broken-down arches or who suffer from varicose veins should not select occupations where they are obliged to stand for hours at a time. They should not become motormen, conductors, or bakers, nor seek work in stores or laundries.

Bricklayers, tanners, and butchers are subject to skin diseases through the handling of cement, hides, and much hot water. Persons afflicted with any inflammation of the skin should not engage in these occupations. Those who are liable to suffer from eczema should be careful not to come in contact with acids, dyestuffs, and other materials which might increase the trouble and make it necessary to give up the work entirely. Such persons are not fitted to become bakers, bricklayers, painters, lacquerers, polishers, cooks, or laundry-workers, or to do any work where the hands are kept long in water.

Persons whose hands perspire freely cannot do good work as engravers, watchmakers, fine-instrument makers, or as workers in any of the fine metals. They are particularly unfitted for the handling of delicate materials, such as laces and linens, and for such fine, clean handwork as millinery, embroidery, sewing, bookbinding, and fine leatherwork.

Industrial Poisoning

Industrial hygiene treats also of the various industrial "poisons" and of how to protect the worker from their harmful effects. One illustration only will be given here, namely, lead poisoning.

Of all the metals employed in the arts and industries, none is so widely and generally applicable as lead. Potters, cutlers, file-cutters, glaziers, lead-workers, painters, operators in electric works, typographers, plumbers, glass-workers, earthenware- and tile-makers, lead-foil-makers, shoe-finishers, employees in mirror and silvering works, some chemical workers, and those who wash lead-workers' clothing are all subject to lead poisoning.

Lead is a subtle poison. Most of its salts have no unpleasant taste or odor, are easily soluble, and produce their baneful effects so gradually and insidiously that the worker often becomes seriously ill without any preliminary warning. The symptoms need not be discussed here, but the way or ways in which the poison enters the human system and the means which may be taken to safeguard the worker will be noted briefly.

The metal gains an entrance to the body through the respiratory organs, the digestive canal, or, occasionally, the skin. Inhaled as dust, it is drawn into the respiratory passages, where it is dissolved and passed into the blood, or it may be suspended in the saliva and swallowed. On reaching the stomach it is acted upon by the hydrochloric acid of the gastric juice, converted into a soluble salt, and absorbed.

To prevent lead poisoning the worker should keep himself in as good general condition as possible, exercise care in the selection of food, avoiding acid fruits and using plenty of milk, come to his work with his stomach well filled, and especially practice rigid cleanliness on leaving the works and before eating. A few months ago the Pullman Company, by the simple expedient of compelling the employees to bathe their hands and faces in hot water for ten minutes, both before luncheon and before going home, reduced its cases of incipient lead poisoning among its painters from seventy-five to none. One white-lead manufacturer advocates giving a free breakfast to the operatives before the beginning of the day's work, while a certain British tile works furnishes hot milk free every morning. Cleanliness with regard to the clothing is also important. In Great Britain the employer of glaze-workers, for example, is required to furnish each of his men with a full suit of washable clothes and to wash and mend them at his own expense every week.

Conclusions

The most important and the ultimate purpose of all this work is, of course, to make good citizens. The employee often fails to see that he is a part of the great public which passes the labor laws and determines the efficiency of their enforcement by means of factory inspection and otherwise. The enforcement of state legislation for working-hours, proper water and milk supply, education of the children, sanitary tenement conditions, efficient health administration, is dependent upon the interest, activity, and intelligence of the public, of which the working class is a large and influential part.

The first and most important step in securing hygienic rights for workingmen is to make sure that they know the rights which the laws already give them. For example, the passage of the workingman's compensation law in 1913 marked a revolution in the treatment of industrial-accident cases in the state of Illinois.

Where previously the injured workman had been the prey of unscrupulous, ambulance-chasing attorneys, of unprincipled employers, and of heartless claim agents and casualty companies, today his legal status is definitely fixed and his compensation or his death benefit automatically provided for, and the field of activity of the lawyers, both reliable and dishonest, is reduced to the minimum. Mr. Samuel Harper, attorney for the Workingman's Compensation Committee, desires to give wide publicity to the fact that now no attorney need be retained by the injured workman, and also to the right which the workman has of appealing to the Industrial Board in case of dispute between the employer and the employee.

What the employee can do for himself as a citizen having equal health rights with employers he has never been taught to see. Perhaps the highest service which can be rendered to society by industrial hygiene is to educate the industrial classes to recognize unhygienic conditions, to co-operate with other citizens in eliminating them, and to secure the enforcement of health regulations. Where can this be done more effectively than in the schools?

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